# CHANGES IN AGRICULTURAL PERFORMANCE IN CHHATTISGARH SINCE 2000:AN ANALYTICAL STUDY

## SUMMARY AND CONCLUSIONS


**Summary**

The state is recognized as mono-cropped rain fed rice production system. Paddy is generally grown in kharif season and it occupies more than 80 per cent cropped area. In some pockets of the State, cultivation of paddy is practiced even during rabi / summer season. The total irrigated area of the state is 29 percent and remaining 71 percent area is rain fed, which depends on vagaries of monsoon. After formation of the state, Government of Chhattisgarh State has given massive emphasis to minimize the poverty amongst the farmers by sponsoring various agricultural development programmes *viz.* crop diversification, input use, promotion of micro-minor irrigation projects, and programmes for livestock and horticultural development etc.

In the light of above facts the present study entitled **"Changes in Agricultural Performance in Chhattisgarh Since 2000: An Analytical Study"** was carried out with the following specific objectives, **(**1**)** to examine the changes in land use pattern in different districts, agro-climatic zones and State,( 2) to assess the changes in cropping pattern in different districts, agro-climatic zones and State, (3**) t**o estimate the changes of input use for crop production,(4) to examine the pattern of changes in area, production and productivity of major crops grown in Chhattisgarh State, (5**)** to estimate the contribution of agriculture sector in Chhattisgarh State Domestic Product,(6**)** to estimate the Agricultural growth rate during the study period and (7**)** to suggest the policy intervention options for the betterment of agriculture sector.

The study was conducted in Chhattisgarh State and the state is comprised of three agro climatic zones namely Chhattisgarh Plain, Northern Hills and Bastar Plateau. The study was carried out across the districts and agro-climatic zones of the state *viz;* Chhattisgarh Plain included Raipur, Dhamtari, Mahasamund, Durg,Rajnandgaon,Kabirdham,Bilaspur,Janjgir-Champa, Korba, Raigarh and Kanker districts, Northern Hills included Jashpur, Surguja and Korea districts while Bastar Plateau includes Jagdalpur and Dantewada districts.

The cross sectional time series data for the year 2000-01 to 2008-09 were used for the study. The data were recorded from the official records and publications of the Directorate of Agriculture, Chhattisgarh Government Commissioner of Land Record & Settlement and Directorate of Economics and Statistics. The cross section time series data were recorded on land use pattern, area, production and productivity of major crops namely Paddy, Wheat, Maize, Kodo - Kutki, Pigeonpea, Chickpea, Urd, Moong, Lathyrus, Kulthi, Soybean, Groundnut, Sesamum, Linseed and Rape Seed & Mustard. The data were also recorded on use of fertilizer, area coverage under improved varieties of major crops paddy, irrigated area, use of farm implements etc. The results of study were reported by applying the simple statistical tools such as averages & percentages, moving averages and triennium ending averages. Multiple regression analysis was used to know the contribution of fertilizers, irrigation and area under improved varieties of paddy to the production of paddy crop only.

To examine the changes in agriculture performance in Chhattisgarh State, the compound growth rate (CGR) were computed in area, production and productivity of major crops, land use pattern, use of fertilizer, area coverage under improved varieties of major crops and agricultural growth during the study period.

## Conclusions

### 1. Pattern of changes in land use

In Chhattisgarh Plains the maximum percentage change increase in double cropped area was noticed followed by gross cropped area and land available for agriculture use .Fallow land and land not available for agriculture use had shown the negative percentage change during the period of study. The compound growth rate in land use pattern of Chhattisgarh Plains indicates that double cropped area and gross cropped area were found to be significant and positive. However, area under fallow land was negatively significant. The slight increase in net and double cropped area was due to increase in area under irrigation, which reflects to increase in the gross cropped area.

In Northern Hills the area under forest was slightly increased. The maximum percentage change in area under fallow land was registered followed by double cropped area, land other than non-agricultural use excluding fallow land, respectively. The maximum negative percentage change was noticed under land not available for agriculture use followed by net cropped area and gross cropped area .The compound growth rate was the maximum in fallow land and lowest in land other than non-agriculture use excluding fallow land. The lowest negative growth was observed in land not available for agricultural use. The area under forest of northern Hills was significantly increased because of the afforestation. Net cropped area was decline significantly in the Northern Hills due to urbanization of most of the districts of Northern Hills.

In Bastar Plateau the maximum positive percentage change was noticed under fallow land followed by double cropped area. The maximum negative change was registered under net and gross cropped area. The compound growth rate was found to be the maximum in fallow

land and lowest in land not available for agriculture use. Area under forest of Bastar Plateau was significantly increased because of afforestation. Net cropped area was decline significantly due to urbanization of the Bastar Plateau and most of the land was acquired for the colonization and other development plans.

In the state area under forest was significantly increased. The maximum percentage change in double cropped area was found followed by gross cropped area and fallow land. The maximum negative percentage change was noticed under land not available for agriculture use followed by net cropped area .The compound growth rate was found to be the maximum in double cropped area and lowest in land available for agriculture use.

The forest area of Chhattisgarh State was significantly increased because of increase in the share of forest area of Bastar Plateau and Northern Hills. Net cropped area was decline significantly in the state because of urbanization and industrialization in most of the districts of the state.

**2. Pattern of changes in cropping pattern and cropping intensity**

The major crops grown by farmers of the state in kharif were paddy, blackgram, maize, pigeonpea and Soybean while during Rabi, lathyrus, chickpea, summer paddy, wheat, rapeseed & mustard, linseed and horse gram were found to be the major crops grown in the state.

The change in cropping pattern of Chhattisgarh Plains was indicates that area of kodo-kutki and horsegram decreased. However, the area of other kharif crops namely paddy, maize, pigeonpea, greengram, blackgram, groundnut, sesamum and soybean shown the positive percentage change over the period of study. The relative percentage change in area of rabi

crops of Chhattisgarh Plains was increased drastically and cropping intensity of Chhattisgarh Plains was increased from 117 percent to 126 percent.

In Northern Hills, area of kharif paddy, kodo-kutki and horsegram was decline whereas, area of other kharif crops was increased .The area of rabi crops was increased after formation of State except horsegram. The cropping intensity of Northern Hills was constant at 111 percent during the period of study.

The relative percentage change in area of kharif paddy, kodo-kutki and sesamum of Bastar Plateau was negative and the area of maize, pigeonpea, greengram, blackgram, horsegram, groundnut and soybean was increase over the period of study.The relative percentage change in area of rabi crops of Bastar Plateau was found to be positive except wheat during the study period. The cropping intensity of Bastar Plateau was constant at 102 percent during the period of study.

In Chhattisgarh State the changes in cropping pattern were indicates that area of kharif paddy and kodo - kutki was decreased, whereas; the area of kharif maize, pigeonpea, greengram, blackgram, horsegram, groundnut, sesamum and soybean was increased. The relative percentage change in area of rabi crops of the Chhattisgarh State was increased in skewed manner except blackgram and linseed. The cropping intensity of the Chhattisgarh State was increased from 110 percent, to 113 percent during the period of study.

**3. Pattern of Changes in Inputs use**

**Pattern of changes in Fertilizer Use**

The consumption of fertilizers of Chhattisgarh Plains was increased during kharif. The maximum consumption of fertilizers was observed in potash followed by phosphorus and nitrogen. The total consumption of fertilizers in Rabi was also increased and the relative

change during the period of the study was 283 percent. It is interesting to note that use of phosphorus and potash was increased comparatively more than that of nitrogen. It was due to more area brought under cultivation of pulses and oilseeds.

In Northern Hills, the change in consumption of fertilizers during rabi was registered the maximum in potash followed by nitrogen and phosphorus. It was due to increased in area of rabi crops and increased in area of oilseeds and pulses during kharif.

The relative percentage change in fertilizers of Bastar Plateau was the maximum of phosphorus followed by nitrogen and potash. The consumption of fertilizers during rabi was increased and the use of nitrogen was maximum followed by potash and phosphorus. It has confirmed that total quantity of fertilizers use was comparatively low as compared to other two agro-climatic zones of the state it was due to agricultural development activities are with held's due to naxalite problem of the Plateau region.

The relative percentage change of fertilizers use of the Chhattisgarh State to be positive during period of the state. The consumption of potash was increased more than that of nitrogen and phosphorus over the period of study welll followed by phosphorus and nitrogen. The consumption of potash during Rabi was more followed by phosphorous and nitrogen. The consumption of fertilizers drastically increased in the state due to increased area of rabi and intensive cultivation of crops are being promoted by the state government.

The growth in fertilizers consumption during kharif of the state significant however the use of fertilizers by agro-climatic zone of the state was also found to be significant growth.

The growth in total fertilizers use during rabi of the state for the period was significant. The growth of total fertilizers use during rabi of Chhattisgarh Plains, Northern Hills and Bastar Plateau was found to be significant.

**Pattern of changes in Irrigated Area**

The percentage change in net and gross irrigated area of Chhattisgarh Plains through tank,well and other source of irrigation was declined drastically. However area irrigated through canal and tube well were found to be positive changed of gross and net irrigated area. It was due to government has started many sponsored programme for agriculture development and provides subsidy for development of assured irrigation sources at farmer's field level. So that farmers discarded the traditional sources of irrigation.

In Northern Hills the pattern of changes in gross and net irrigated area through tube well and well was increased significantly as compared to the other sources of irrigation. The gross and net irrigated area by canal, tank, and other sources was increased positively over the periods of study and net irrigated area of well source was decline. It indicates well source has converted into tube well source of irrigation.

In Bastar Plateau irrigated area by tank and well sources was speedily decline and the maximum percentage change in net irrigated area was found under tube well source followed by canal and other source. The farmers of Bastar Plateau discarded the traditional sources of irrigation namely tank and well sources of irrigation and adopted more advanced and assured irrigation sources because of State government has provided subsidy to the farmers for digging of tube well and provided free electricity up to 5 HP pump.

Overall pattern of changes in irrigated area by source of the Chhattisgarh State were showing the area of well source was drastically decline in the state. The gross and net irrigated area of tank source was also decline during the periods of study but their rate was comparatively low than that of well source of irrigation. The gross and net irrigated area of tube well source was increased comparatively more than that of canal source of irrigation. It

can be concluded that well source of irrigation was continuously discouraged by farmers of the state and it was replaced by Tube well source of irrigation due to free electricity provided by the state government up to 5 HP pump and subsidy provided to the farmers for digging of tube well.

Growth in gross irrigated area of canal, tube welll and other sources of irrigation of the state was significant. The negatively non-significant growth in gross irrigated area though tank of the state was noticed whereas, negative and significant growth in gross irrigated was registered through well source of irrigation. The similar pattern of growth in gross irrigated area through tank and well sources of irrigation was noticed to Chhattisgarh Plains and Bastar Plateau.

The irrigation through well source was continuously declining during period of the state. The negative and significant growth of well irrigated area was noticed in Chhattisgarh Plains and Bastar Plateau agro-climatic zones of the state. While positive and significant growth in gross irrigation through well was noticed in Northern Hills.

The irrigation through other sources of the Chhattisgarh State was positive and non-significant growth. The negative and non-significant growth in gross irrigated area of other source irrigation was noticed in Chhattisgarh Plains and positively and non-significant growth in gross irrigation through other sources was registered in Bastar Plateau. The irrigation through other sources in Dhamtari, Kabirdham, Janjgir-Champa and Jagdalpur district was negative and significant. However, negative and non-significant growth in gross irrigated was registered in Mahasamund, Rajnandgaon, Raigarh, and Jashpur districts of the state.

Net irrigated area of the state by canal and tube well sources were showing positive and significant growth. The negative and significant growth of net irrigated area through well was

registered whereas, tank and other sources was showing non-significant and negative growth of net irrigated area of the state.

Similar trend in growth of net irrigated area by canal and tube well sources for Chhattisgarh Plains was observed. While growth in net irrigation area by tank, tube welll and other sources of Northern Hills was significant. The net irrigated area through well source was significantly decline in Northern Hills. Growth in net irrigated area by source in Bastar Plateau was negative and non-significant. However, growth in net irrigated area in Bastar Plateau was significant.

**Pattern of changes in farm implements use**

The pattern of changes in use of farm implements of Chhattisgarh Plains was indicates that oil based engines were found to be more or less constant. However, use of electric pumps was the maximum and it was registered positive percent change over the period of study followed by tractors and plant protection equipments, respectively.

In Northern Hills, the pattern of changes in use of farm implements was observed from the result that use of farm implements was found to be positive percentage change during the periods of study. The maximum relative percentage change was observed in plant protection equipments followed by electric pumps, tractors and oil based engine, respectively.

In Bastar Plateau agro-climatic zone of the Chhattisgarh State the relative percentage change in use of oil based engines was decreasing during the period of study. Whereas, the use of tractors and electric pumps was noticed to be increasing.

In Chhattisgarh State the pattern of changes in use of farm implements namely tractors, electric pumps, oil based engines and plant protection equipments, was increased during the periods of

study. The relative percentage change in use of electric pumps was the maximum followed by tractors, plant protection equipments and oil based engines respectively.

Growth in use of electric pump, tractor and plant protection equipment in the state was significantly. The use of oil based engine was observed non-significant growth.

The growth of electric pump, tractor and plant protection equipment of Northern Hills was similar to the growth of the state. However, use of oil based engine, electric pump and tractor in Northern Hills was registered significant growth. While the negative and significant growth was recorded in use of oil based engine in Bastar Plateau. The growth in use of electric pump and tractor was significant in Bastar Plateau.

**4. Pattern of changes in Area, Production and Productivity of major corps**

Production of major kharif crop paddy was increase due to major share of increase yield over the periods of study. The production of maize, green gram, black gram, groundnut, sesamum and soybean was increase significantly over the periods of study, it was due to increase in area and yields of crops. The area of kodo-kutki, pigeonpea and horsegram of this agro-climatic zone was drastically decline caused to decline in production of these crops during the study periods. The production of all rabi crops was increased significant during the study periods except blackgram and linseed. The increase in production of rabi crops was attribution of increase in area and yield of crops in the study periods.

The relative percentage change in production of major kharif paddy of Northern Hills was increase due to increase in yield of paddy while area was decline. The production of maize, greengram, blackgram, horsegram, groundnut, sesamum and soybean were also showing positive percentage change over the study periods. The increase in production of these

crops was attribution of increase in area and yield. The production of kodo-kutki and pigeon pea was decline due to decrease in area of kodo-kutki and decline in yield of pigeonpea.

The major Rabi crops of Northern Hills were wheat, chickpea, linseed and rapeseed & mustard and their production was increase significantly due to increase area and yields both of these crops except yields of rapeseed & mustard was decline. The production of maize and horsegram was decline due to decrease in area while production of horsegram was decline due to decrease area and yield during the study periods.

Production of major kharif crop paddy of Bastar Plateau was significantly increase, which was due to increase in yield of paddy. The production of maize, greengram, blackgram, horsegram, groundnut, sesamum and soybean was also showing positive percentage over the periods of study. This increase in production of crops was found to be increase in area and yields of these crops except decline in area of sesamum of Bastar Plateau.

The production of rabi crops of Bastar Plateau namely wheat, maize, summer paddy, chickpea, horsegram, lathyrus and linseed was increase significantly due to increase in area under rabi crops over the periods of study except area of maize and yields of horsegram was noticed to be decline during the study periods.

The relative percentage change in production of major kharif crop paddy of Chhattisgarh State was noticed positive. This increase in production was mainly due to increase the yield of paddy whereas area was decline. The production of maize, greengram, blackgram, horsegram, groundnut, sesamum and soybean was found to be positive percentage change over the period of study. The increase in production was attributed to increase in area and yields of these corps except decline in yield of greengram and blackgram. The production

of kodo-kutki was decrease due to decline in area. The production of pigeon pea was found to be negative percent change over the periods of study was due to mainly decline in yield.

The production of wheat, maize, summer paddy, chickpea, greengram, horsegram, lathyrus rapeseed & mustard and groundnut of the state was found to be positive percentage over the periods of study. This increase in production of crops was due to increase in area and yields of crops except horsegram and rapeseed & mustard, which was found to be negative percentage change in yields of these crops.

The growth in production of rice in Chhattisgarh State was found to be significant. This increase in production of paddy of the state was attribution of significant increase in yield whereas; area was non-significant decline. The similar trend in growth of production of paddy was also noticed which was found to significant at 1 percent probability level. The growth in area, production and productivity of paddy in Northern Hills and Bastar Plateau was showing different trends than that of Chhattisgarh Plains and Chhattisgarh State. The growth in production of paddy in these two agro-climatic zones was non-significant which was due to non-significant sharing of productivity of rice over the period of study.

The growth in production of maize in Chhattisgarh State was found to be significant which was due to increase in yield and area. Growth in production of maize in Chhattisgarh Plains, Northern Hills and Bastar Plateau was also found to be significant.

The negative growth in production and area of kod-kutki was registered in the state. While growth in yield of kodo-kutki was non-significant. The similar trend in growth of production of kodo-kutki was also noticed in all the agro-climatic zones as well as State.

The growth in production of pigeonpea of the state was negative and significant. This negative growth in production of pigeonpea was attribution of decline in yield significantly. The production and yield of pigeonpea in Chhattisgarh Plains was decline. While area of crop was significantly increase. The similar trend in growth of production, area and yield of pigeonpea of Northern Hills and Bastar Plateau was noticed as registered to the state.

The growth in production of moong during the period of study of the state was significant due to significant increase in area, while yield was negative and significant. The growth in production of moong by agro-climatic zone of the Chhattisgarh State was also showing result as noticed for the state, the major share in production of moong of agro-climatic zones of the state was increase in area significant, while decline in yield significant except northern hill zone of the state.

The growth in production of urd of the state during the period of study was non-significant. The growth in production of urd was significant in Northern Hills and Bastar Plateau. While non-significant growth was recorded in Chhattisgarh Plains. The growth in production of urd was attributed mainly to increase in area of crop.

The growth in production of horsegram over the period of study of Chhattisgarh State was significant. Growth in production of horsegram in Chhattisgarh Plains was negative and non-significant due to non-significant decline in area and significant increase in yield. Non-significant growth in production of horsegram was noticed in Northern Hills while significant growth in production of horsegram of Bastar Plateaus.

Growth in production of groundnut of Chhattisgarh State was significant due to shares of increased in area and yield. However, growth in production of groundnut by agro-climatic

zone was also showing the similar. The significant growth in production of crops by agro-climatic was due to attribution of increased in area and productivity of the crop.

The growth in production of sesamum of Chhattisgarh State was significant which was attributed by significant growth in yield and non-significant growth in area. The significant growth in production of sesamum was observed in Chhattisgarh Plains and Northern Hills while non-significant growth in production was noticed in Bastar Plateau. It was due to significant growth in area and yield of crop in Chhattisgarh Plains and non-significant negative growth in Bastar Plateau.

The growth in production of soybean of Chhattisgarh State was significant. The pattern of growth in area, production and productivity of soybean of agro-climatic zones of the state was similar to the state except non-significant increase in area of soybean in Bastar Plateau.

The compound growth in area, production and productivity of wheat of Chhattisgarh State was positive and significant. Growth in production of wheat by agro-climatic zones of the state was showing positive and significant. The major share to increase the production of wheat was due to increase in area and productivity of crop. While production was non-significant increasing in Bastar Plateau, which was shared by significant growth in yield and negative non-significant growth in area.

Growth in production of rabi maize of the Chhattisgarh State was significant. This was due to significant growth in area and yield. The growth in production of rabi maize in Chhattisgarh Plains and Bastar Plateau was significant, which was shared by significant contribution of area and yield during the study period.

The growth in area, production and productivity of summer paddy of Chhattisgarh was found to be significant. The significant growth in production of summer paddy was registered in Chhattisgarh Plains and shared by significant increase in area and yield. While non-significant growth in production of summer paddy of Northern Hills and Bastar Plateau was noticed, this was due to non-significant growth in area and yields both of the respective agro-climatic zones of the state.

The growth in production of lathyrus of the Chhattisgarh State was significant and growth in production of lathyrus of Chhattisgarh Plains, Northern Hills and Bastar Plateau were also found to be significant. The increase in production of lathyrus of agro-climatic zones was shared by significant increase in area and yield of crop for Northern Hills and Bastar Plateau, while significant increase in area and non-significant increase in yields were noticed for Chhattisgarh Plains during the period of study.

The growth in production of chickpea of Chhattisgarh State was significant due to increase significant growth in area and yield. The pattern of growth in area, production and productivity of chickpea of agro-climatic zones was noticed to similar growth as noticed for the Chhattisgarh State. It was attributed to the significant increase in area and yield of all the three agro-climatic zones of the state.

The growth in production of rabi moong of the state was attributed with increase of area. The similar trend in growth of moong for area, production and productivity was noticed for Chhattisgarh plain. While negative growth in production of moong was noticed in Northern Hills and Bastar Plateau. The main reason for negative growth was decline in area significant of Northern Hills and Bastar Plateau.

The growth in production of rabi urd of the Chhattisgarh was negative and significant. The major reason in decline the production of rabi urd of the state due to significant declining to yield of crop of the state, while area of rabi urd increased non-significantly. The similar trend in growth of area, production and productivity of all the agro-climatic zones was noticed as observed for the state.

Growth in production of horsegram of the state was significant due to significant increase in area non-significantly growth in productivity. Growth in area, production and productivity of horsegram during the study period of Chhattisgarh Plains was showing the similar growth of area, production and productivity as observed for the state. While growth in production of horsegram of Northern Hills and Bastar Plateau was positive and non-significant, this was due to non-significant positive growth in area and negative and non-significant growth in productivity of crop during the period of study.

The compound growth in area, production and productivity of groundnut of Chhattisgarh State was significant. The negative and significant growth in production was observed in Northern Hills due to significantly decline in area although significant growth in productivity of crop. Bastar Plateau was showing just reverse trend in growth of production, area and yield as noticed in Northern Hills. The growth in area, production and productivity of groundnut was showing just similar trend as observed for the state.

The negative and non-significant growth in production of sesamum of the state was observed due to declining in productivity of crop. While significant increase in area of crop during the study period. All the three agro-climatic zones of the state showing negative growth in production of crop, which was due to significant decline in area of crop of Chhattisgarh

Plains and Northern Hills. While, significant decline in productivity of crop of Bastar Plateau.

**Contribution of factors of the production of Paddy**

The multiple regression analysis was used to know the contribution of fertilizers, irrigation and area of high yielding varieties (HYVs) to the total production of paddy crop. The results are indicates that overall contribution **($R^2$)** of fertilizers(X1), irrigation(X2) and area of HYVs(X3) to the total production of paddy was 37 percent. The individual contributions of these factors were 0.01, -0.68 and -0.88, respectively. The positive and non-significant contribution was registered in use of fertilizers while application of irrigation to paddy was made negative and significant contribution to the crop. The area of HYVs was contributed negatively and non-significant effect to the crop. Thus it can be inferred from the result that application of irrigation to paddy is not desirable, it is because of paddy is mostly grown in rainy season so it makes adverse effect to the production resulted application of fertilizers and use of high yielding varieties (HYVs) are not being given significant response to the production of crop.

**5. Growths of Agriculture Sector and Gross Domestic Products (GDP) of Chhattisgarh**

GDP of the state was growing significantly and it was found to be 17.70 percent growth over the period of study. Among three sectors of the economy, the maximum and significant growth was noticed in secondary sector and found to be 25.74 percent growth over the period of study followed by primary sector (15.80%) and tertiary sector (13.32%), respectively. The growth in share of agriculture sector to State GDP was 14.24 percent and it was found significant growth over the period but it was below to the growth of primary sector. Under the secondary sector, construction work growing like a bloom and its growth was registered to be 31.65 percent over the period of study.

The trend in growth of NDP of all the three sectors was found to be similar as noticed in growth of GDP of the state. It was registered the maximum and significant growth in secondary sector (27.75%) growth followed by primary sector (13.13%) and tertiary sector (11.15%).The growth in agriculture sector was significant and found to 10.22 percent growth over the period of study.

**6. Growth of Agriculture Sector and Net Domestic Product of Chhattisgarh State**

The growth of NDP of the state was significant and found to be 14.13 percent growth at current prices over the period of study. The maximum and significant growth of NDP of secondary sector was observed at current prices followed by primary sector (12.88%) and tertiary sector (11.78%), respectively.

Among the secondary sector, maximum growth was noticed in construction work. However, forest industry of primary sector was leading to the growth of NDP while agriculture sector was in second place in growth NDP. Whereas, mining and fishing of primary sector were place on third and fourth position.

The growth of NDP agriculture sub-sector of the state was found to be significant, which was comparatively higher growth than that of other States of the country and country as a whole.

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